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NUCLEAR WASTE MANAGEMENT PROGRAM PROCEDURE

NP 9-1
ANALYSES
Revision 4

Effective Date: 08/29/01

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	(printed name)	(signature)	date

1.0 Purpose and Scope

This procedure specifies methods for controlling and documenting analyses performed by Sandia National Laboratories (SNL) for the SNL Waste Isolation Pilot Plant (WIPP) program. This procedure applies to scientific and engineering analyses (theoretical or computational). Examples of analyses covered by this procedure include:

Compliance Decision (CD) – compliance, certification, or recertification analyses whose output is relied upon to make design, analytical, operational, or compliance-based decisions with respect to the performance of the waste confinement system. These results will be used in supporting an application for certification or recertification of a permit or license (e.g., performance assessment, data analysis, parameter development).

Programmatic Decision (PD)– programmatic, scoping, or sensitivity analyses associated with programmatic decisions. These analyses may be considered as *scoping* or screening in that they apply to development, implementation, and testing of improvements to the existing methodology. Scoping calculations include evaluative efforts regarding features, events, and processes (FEPs) screening, conceptual/mechanistic model evaluation, or assessment of grid adequacy. *Sensitivity* analyses can focus on testing the impact of alternative modifications for improving capabilities for conducting performance assessments (PAs) and for communicating and explaining the results of a PA.

> Note: With written permission granted in advance by the Carlsbad Programs Group Manager relying on input from the Responsible Manager and Software Quality Assurance, some software that is required to support various Analysis Reports may need to be used prior to full qualification. Collection of quality data and subsequent analysis with PD software is assumed to be a risk, because completion of the required software QA documentation may require critical code modifications and may require that some programmatic decision-type calculations be redone.

Routine Calculations – simple data manipulations, detailed formulas or macros (e.g., unit conversions, interpolations, translations, rotations, or simple analytic solutions) that can be verified by hand calculations.

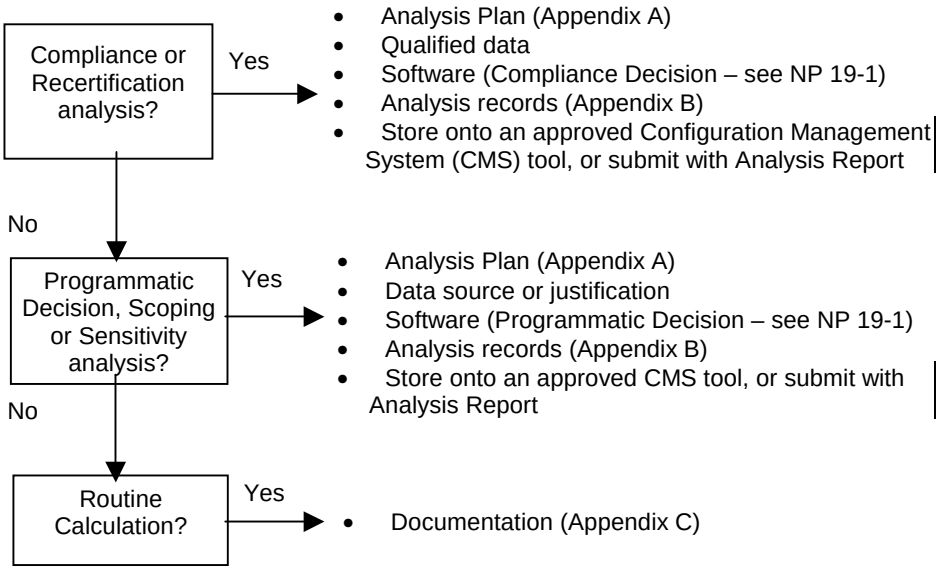
This procedure governs only the conduct of the analysis, not the process for qualifying software used in an analysis (see NP 19-1).

Acronyms and definitions for terms used in this procedure may be found in the NWMP Glossary located at the Sandia National Laboratories (SNL) NWMP On-line Documents web site.

2.0 Implementation Actions

2.1 General

Below is an overview of the requirements for conducting the various levels of analysis:



2.1.1 Analysis Plan Preparation and Approval

The author (e.g., Principal Investigator, analyst, designee) prepares a plan consistent with requirements found in Appendix A. The author then submits the plan for technical, QA, and management review and approval, following the flow chart in Appendix D (Analysis Plan/Revision Review and Approval). The author shall submit the Analysis Plan (AP) for issuance as a controlled document in accordance with NP 6-2.

2.1.2 Analysis Plan Changes/Revisions

Documentation shall be provided for deviations from the original analysis plan. Deviations include the performance of activities not described in the plan as well as activities defined in the plan that were not performed. Deviations can be documented as part of the final analysis records (Appendix B) or by revising the plan (Appendix D). When revising the AP, the author shall ensure that changes to the AP are clearly indicated with vertical change bars in the margin of the revised plan (Note: change bars will indicate changes for the current revision only). Changes to an AP shall receive technical, QA, and management review in accordance with NP 6-1 and shall be issued as a controlled document in accordance with NP 6-2.

2.1.3 Analysis Plan Implementation

The author shall:

- Oversee implementation of the analysis plan.
- For software that that was executed on an approved CMS ensure that the source code, input and output files, scripts and any other information needed to re-run the calculation are stored onto the centralized storage system (e.g., COMPAQ/DEC CMS). For software that is not executed on an approved CMS ensure that all files necessary to re-run the calculation are submitted with the Analysis Report.
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- Oversee preparation of the analysis records as described in Appendix B.
- Ensure proper review of the analysis records (see Appendix E) and submittal to the SNL WIPP Records Center. Document Review and Comment forms (DRC) shall be used to document comments and their resolution for the analysis records.

Note: For compliance analyses, only qualified software, data, and inputs shall be used.

2.2 Routine Calculations

2.2.1 Documentation of Routine Calculations

Documentation for routine calculations shall follow the criteria in Appendix C.

2.2.2 Review of Routine Calculations

Routine calculations shall receive both technical and QA review and approval.
The technical review shall be accomplished using one of the following methods:

- Separate independent calculations of the original work
- A check of the steps in the original calculations
- A spot or random check of the original calculations.

The technical reviewer shall document the choice of the method used, along with his/her name and signature, the date of the review, and the results of the review.

The QA reviewer shall document the results of the review and provide his/her name, signature, and the date of the review.

Both technical and QA review can be documented on Form NP 6-1-1, Document Review and Comment Form (DRC), or directly on the document itself. DRCs must be submitted to the SNL WIPP Records Center with the calculation, spreadsheet, or listing of the auxiliary/utility code.

Note: Routine calculations normally stand alone; however, several routine calculations may be conducted under an Analysis Plan. In the latter case, the routine calculations can be reviewed as part of the analysis records and do not require a separate review as described above.

3.0 Records

The following QA records, generated through implementation of this procedure, shall be prepared and submitted to the SNL WIPP Records Center in accordance with NP 17-1 (Records).

QA Record	Preparer	Records Submitter
• The final, approved new/revised Analysis Plan (per Appendix A)	Author	Document Control
• Analysis Records (per Appendix B)	Author	Author
• Analysis Records DRC forms (NP 6-1-1)	Author and Reviewers	Author
• Routine Calculation documentation (per Appendix C)	Author and Reviewers	Author

4.0 Appendices

Appendix A: Analysis Plan Content and Format
Appendix B: Analysis Records
Appendix C: Routine Calculation Requirements
Appendix D: Analysis Plan/Revision Review and Approval Flow Chart
Appendix E: Analysis Records Flowchart

Appendix A
Analysis Plan Content and Format

Analysis Plans shall include the following:

- **Cover page**
  - Title of Analysis
  - Effective date (assigned by Document Control)
  - Author (name, title, organization, signature, date)
  - Technical, QA and Management Reviewers (name, title, organization, signature, date)

- **Document Control Header** – To be included on the upper right-hand side of each page.
  - Analysis plan number (obtained from Document Control)
  - Revision Number
  - Page (number) of (total number)

- **Content Requirements** – The following shall be included, unless the nature of the work does not involve the item/concept.

  1. **Introduction and Objectives.** A description of the scope of the analysis, the objectives to be achieved or hypotheses to be tested, and the initial assumptions:
     - discussion of the conditions, scenarios and general purpose of the analysis
     - description of assumptions relating to the implementation of any conceptual models
     - identification of potential sources of error and uncertainty and how they will be controlled
     - type of analysis to be performed (i.e., compliance decision or programmatic decision)

  2. **Approach.** A description of the analytical approach, including a discussion of the computer codes and parameter input to be used in the analyses.

  3. **Software List.** List software expected to be used.

  4. **Tasks.** A listing of the primary tasks and how they will be documented, the identity of the individuals who will perform the tasks, task deliverables and expected completion date.

  5. **Special Considerations.** The identification of prerequisites, special controls, processes, skills and certification requirements

  6. **Applicable Procedures.** The identification of any applicable controlling documents, such as program procedures (e.g., NPs) or project procedures (e.g., SPs).

Appendix B
Analysis Records

Analysis records shall provide sufficient documentation so that a qualified technical person could reconstruct the work and reproduce the results. The following information shall be included by the author (e.g., Principal Investigator, analyst, designee) in the analysis records, unless the nature of the work does not involve the item/concept:

1. Provide reference to the analysis plan and any revisions.

2. Provide detailed explanation of the scientific approach or technical method used to perform the analysis;
   - A discussion and sketch of the grid for any scientific codes.
   - Boundary conditions and initial conditions.
   - Time period of analysis.
   - Any other aspects of the approach that are necessary to provide traceability and reproducibility.

3. List name, version and platform of any computer software used in performing the analysis and indicate if calculation was or was not executed on the CMS.

   For software not executed on an approved CMS tool: (1) provide all files necessary to reproduce the calculations (e.g., source code, macros, inputs, outputs, executables) with the Analysis Report, and (2) provide an explanation of how control of use was accomplished, and a description of the execution environment, including:
   - Execution flow (e.g., hardware, operating system version)
   - Code flow
   - Run control

4. Identify inputs and input sources (i.e., variables that affect interrelated scientific investigations) to assure comparability among the related variables, and documentation of the appropriate control of these variables. Provide:
   - Each parameter (with brief description) by computer code.
   - Map of each model parameter to the grid for each computer code. The mapping between computational grid and material regions may be used along with a listing of the model parameters required for each material region.
   - Identification and discussion of the choices of numerical control variables and other values that are input to the codes via input files.
   - Identification of the values of variables that are hard-wired into computer codes and are significant to the results.
   - Discussion of the use of input variables which result from other codes; reference the analysis plan or other documents describing the analysis that produced the results used as input to this analysis.

5. Provide qualification/justification for data/input:
   - For **programmatic decision** analysis, identify source of data or justification of values used if no data exists.
   - For **compliance decision** analysis, identify qualification and basis for input used.

6. Describe the work performed and the results obtained, including:
   - Tables, plots and discussion of results. Provide sufficient detail to demonstrate to an equally qualified technical person that the results of the analyses adequately meet the purpose of the analysis.
   - Discussion of any other items that are necessary for traceability, transparency, and reproducibility.

7. Provide documentation of any changes from the analysis plan that occurred during the performance of the analysis, including the reason for the changes (note: not necessary if the plan was revised and re-issued).

8. List names and respective roles of those individuals involved in conducting the analyses.

9. Provide Document Review and Comment forms (DRCs) used to document the review of the work

Appendix C
Routine Calculation Requirements

Documentation of routine calculations is intended to provide sufficient detail to allow reproducibility of the calculation, spreadsheet, or auxiliary/utility code by an independent technical person. Documentation of routine calculations can be in any format (e.g., memo, scientific notebook, contractor report). The author (e.g., Principal Investigator, analyst, designee) shall ensure the following information is included:

1. Title of calculation

2. Associated planning document identifier (e.g., analysis plan, test plan), if applicable

3. A clear description of each step or clear definition of each algorithm used in the calculation, spreadsheet, or auxiliary/utility code.

4. Identification/listing of input, input sources, and output

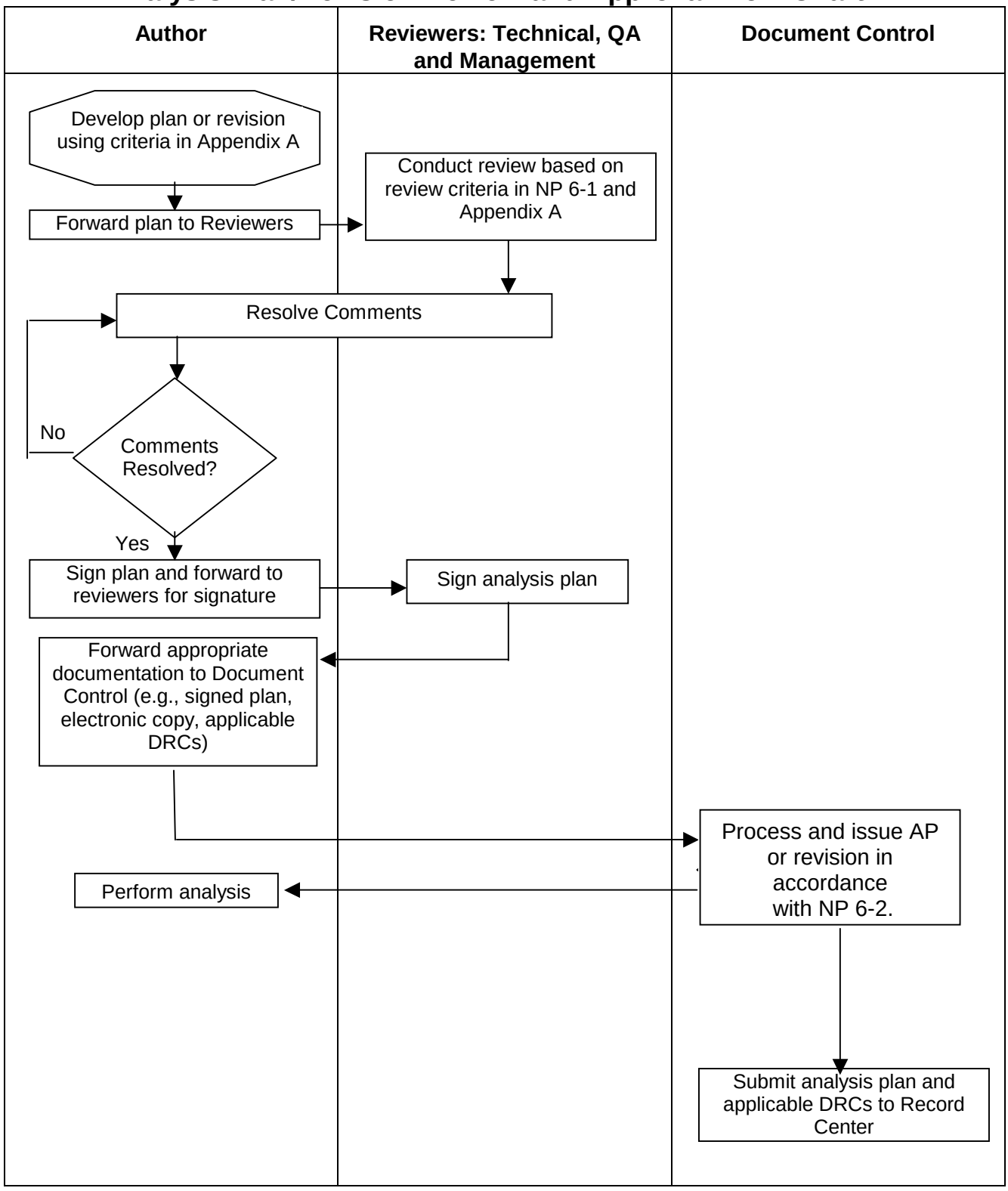
5. Data qualification or justification:
   - For **programmatic decision** analysis, identify source of data or justification of values used if no data exists.
   - For **compliance decision** analysis, identify qualification and basis for input used.

6. If software was used to do the calculation (e.g., a spreadsheet, database, or graphing program), identify the name and version of the software, the platform on which it was run, and illustrate how the specific application provides the correct results for the specified range of input parameters.

   Note: The software used for routine calculations should be submitted as part of the documentation if needed for reproducibility.

7. Dates and results of reviews, along with the names and signatures of the analyst and reviewers (technical and QA).

Appendix D
Analysis Plan/Revision Review and Approval Flow Chart



Appendix E
Analysis Records Flow Chart